Research Journal of

Microbiology

ISSN 1816-4935

Academic Journals Inc.

www.academicjournals.com

Research Journal of Microbiology 2 (5): 496-499, 2007
ISSN 1816-4935

Microbial Quality and Antibiotic Sensitivity Pattern of Bacteria Isolated from Different Sections of a State Specialist Hospital

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Abstract: Microbial quality of the air in the main operating theater, male and female surgical wards of State Specialist Hospital Akure was assessed. The female surgical ward was found to have the highest Total Viable Count (TVC) of 42.25 cfu/plate while the least TVC was recorded in the main operating theater (3.25 cfu/plate). The bacteria isolated from the different sections sampled include *Escherichia coli*, *Staph. aureus*, *Proteus mirabilis*, *Klebsiella pneumoniae* and *Bacillus subtilis*. Antibiotic sensitivity test reveal different sensitivity pattern of bacteria even within the same species. The antibiotics that were found to be most effective are Clindamycin (90.90%), Cloxacillin (81.81%), Norfloxacin (81.81%), Daravid (81.81%), Ciprofloxacin (72.73%) and Chloraphenicol (72.73%). Hospital management are advised to monitor the quality of the hospital environment periodically to know the bacterial pathogens that are prevalent and the effective antibiotics against such pathogens.

Key words: Bacteria, hospital, antibiotics, sensitivity

INTRODUCTION

Hospital acquired (nosocomial) infections occur in about 5% of all patients admitted to hospital (Madigan *et al*., 2000). Ironically, medical procedures are designed to cure diseases, but some procedures used in the treatment of diseases can inadvertently introduce pathogenic microorganisms into the body and initiate an infectious process (Atlas, 1988). Nosocomial infections result from interaction of several factors such as: Microorganisms in the hospital environment; the compromised immune status of the host and the chain of transmission in the hospital (Tortora *et al*., 2004).

Staphylococcus aureus had been reported as the most important and widespread hospital pathogen (Madigan *et al*., 2000). This bacterium had been implicated as the most common cause of surgical wound infections and pneumonia and the second most common cause of blood infections (Atlas, 1988; Madigan *et al*., 2000). *Staphylococcus aureus* among hospital staff and extensive contamination of the hospital environment is common (Thomas, 1988). Other pathogens common in hospital environment include *Escherichia coli*, *Enterococcus species*, *Pseudomonas aeruginosa*, *Candida albicans* and *Klebsiella pneumoniae* (Fuerst, 1983; Atlas, 1988; Madigan *et al*., 2000).

The advent of antibacterial drugs has helped to decrease the seriousness of many types of infections, particularly streptococcal infection. In the case of infections caused by S*taphylococcus aureus* and the coliform group, the results have been less satisfactory (Thomas, 1988). Nosocomial infections caused by these organisms still present serious problems because of development of resistance to these antibacterial agents (Lamikanra and Okeke, 1997). The major mechanism by which bacteria acquire resistance against antibacterial agents is through acquiring resistance plasmid (R-plasmid) (Hart and Kariuki, 1998). Resistance to antibiotics is highly prevalent in bacterial isolates, particularly in developing countries (Lamikanra and Okeke, 1997; Hart and Kariuki, 1998; Okeke *et al*., 1999).

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The present study was designed to ascertain the microbial quality of five (5) different sections of State Specialist Hospital, Akure and to determine the antibiotic sensitivity pattern of bacterial isolates obtained from these sections.

MATERIALS AND METHODS

Isolation and Characterization of Bacterial Isolates

Nutrient agar (Oxoid) was prepared according to manufacturer's instruction. Four plates each were exposed to the Female Surgical Wards (FSW), Female Medical Ward (FMW), Male Surgical Ward (MSW), Male Medical Ward (MMW) and the Operating Theater (OPT) of State Specialist Hospital Akure for 1 h. The plates were taken to the laboratory of Department of Microbiology, Federal University of Technology, Akure, Nigeria, where they were incubated at 37°C for 24 h and counted to know the Total Viable Count (TVC) in the air of the sections sampled. Discreet colonies observed after the incubation were subcultured to obtain pure culture. Standard microbiological methods were used for the characterization of bacterial isolates obtained using Bergey's manual of determinative bacteriology (Holt, 1981).

Antibiotic Sensitivity Test

The antibiotic sensitivity test of bacterial isolates from different sections of the Hospital was ascertained by employing both Gram positive and Gram negative sensitivity disc, product of MultoDisk, Lagos. The discs were placed on the surface of the solidified Nutrient agar that had earlier been seeded with bacterial isolates from the sections of the hospital sampled, using sterile forcept. The plates were incubated for 24 h after which they were examined for zones of inhibition.

Data Analysis

Data gathered from the sampling of the air in the various sections of the hospital were processed by descriptive One-way Analysis of Variance (ANOVA) using SPSS version 11.0 package.

RESULTS

The Total Viable Count (TVC) obtained from the FSW (42.25 cfu/plate) was the highest while the lowest TVC was obtained from the main operating theater (3.25 cfu/plate) (Fig. 1). There was a

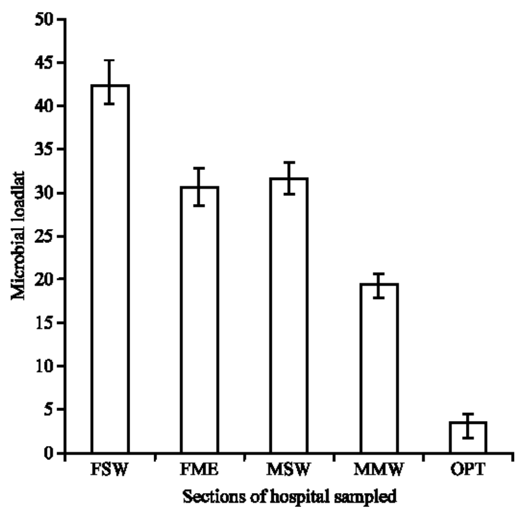

Fig. 1: Microbial load (cfu/plate) of different sections of state specialist hospital akure

Table 1: Distribution of bacterial isolates in different sections of the hospital

Isolates	FSW	FMW	MSW	MMW	OPT
Escherichia coli	-	+	+	-	+
Klebsiella pneumoniae	-	-	+	-	-
Staphylococcus aureus	+	+	+	+	+
Bacillus subtilis	+	-	-	-	-
Proteus mirabilis	+	-	-	-	-

-: Absent; +: Present

Table 2: Antibiotic sensitivity pattern of bacteria isolated from different sections of state specialist hospital, akure

Antibiotics	MSW *E. coli*	MSW Kleb	MSW *Staph*	MMW *Staph*	FSW *Staph*	FSW *Baci*	FSW *Prot*	FMW *Staph*	FMW *E. coli*	OPT *E. coli*	OPT *Staph*	Sensitivity of cloxacillin (%)
Cloxacillin	++	-	+++	+++	++	++	++	+++	++	-	+++	81.81
Septrin	+	+	-	-	-	-	+	-	-	++	-	36.36
Rocephine	++	-	-	-	++	-	-	-	-	-	-	18.18
Sparflocin	-	++	-	-	-	-	-	-	-	-	-	9.09
Daravid	++	+++	+++	-	++	+++	++	-	++	++	+++	81.81
Erythromycin	++	-	-	-	-	++	-	-	+	-	-	27.27
Ciproxime	-	-	-	-	-	-	-	-	-	-	-	0
Clindamycin	++	-	+++	+++	+++	++	++	++	++	++	+++	90.9
Gentamycin	-	-	-	-	-	+	-	-	++	-	-	18.18
Nitrofuraton	++	+	-	-	-	-	-	-	-	++	-	27.27
Augumentin	-	-	-	-	-	-	-	-	-	++	-	9.09
Norfloazacin	-	++	-	+	+	++	++	+	+	++	++	81.81
Ciprofloxacin	-	++	+++	+++	+++	++	-	+++	++	++	-	72.72
Chloramphenicol	-	+	-	+	+	++	++	++	+	-	++	72.72
Ampicillin	+	-	-	-	-	-	-	-	-	++	-	18.18
Nalidixic acid	++	++	+	-	-	++	-	-	-	-	-	36.36
Cefuroxime	-	++	-	++	-	-	-	+	-	-	-	27.27

+: Zone of inhibition of 10mm or less; ++: Zone of inhibition of 20 mm or less, +++: Zone of inhibition above 20 mm; -: No inhibition, MSW *E. coli*: *Escherichia coli* isolated from male surgical ward, MSW Kleb: *Klebsiella pneumoniae*, isolated from male surgical ward, MSW Staph: *Staphylococcus aureus* isolated from male surgical ward, MMW Staph: *Staphylococcus aureus* isolated from male medical ward, FSW Staph: *Staphylococcus aureus* isolated from female surgical ward, FSW Prot: *Proteus mirabilis* isolated from female surgical ward, FSW Baci: *Bacillus subtilis* isolated from female surgical ward, FMW Staph: *Staphylococcus aureus* isolated from female medical ward, FMW *E. coli*: *Escherichia coli* isolated from female medical ward, OPT *E. coli*: *Escherichia coli* isolated from operating theater, OPT Staph: *Staphylococcus aureus* isolated from operating theater

significant difference in the TVC obtained in MMW (19.25 cfu/plplate) when compared to FMW and MSW that have 30.50 and 31.50 cfu/plate, respectively. The bacterial isolates of the different sections of the hospital is presented in Table 1.

Table 2 reveal the antibiotic sensitivity pattern of the bacterial isolates. It was observed that the different isolates show different sensitivity pattern to the antibiotics. The antibiotic sensitivity patterns of bacteria of the same species also differ. The most effective antibiotic against the isolates was Clindamycin (90.90%) followed by Cloxacillin, Daravid and Norfloxacin having 81.81% activity respectively. Ciproxacin and Chloramphenicol showed appreciable level of activity (72.73%) against the isolates.

DISCUSSION

A hospital environment may not be a place where people get well but may also be a place where sick people get sicker (Madigan *et al*., 2000). Infections in hospital environment are as a result of the following factors: Microorganisms in the hospital, the compromised immune status of patients and the chain of transmission in the hospital (Tortora *et al*., 2004). The alarming frequency with which microorganisms in the hospital environment acquire resistance to antibiotics, particularly by the mechanism of transmissible drug resistance and the fact that the antibiotics to which they remain sensitive are often highly toxic has made nosocomial infection a serious problem (Thomas, 1987).

In this report, the microbial load obtained from the different sections of the hospital varies. The Total Viable Count (TVC) obtained in Female Surgical Ward (FSW) was higher and significantly different ($p \leq 0.05$) from the other sections (Fig. 1). The bacteria isolated from the hospital sections sampled are *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Bacillus subtilis* and *Proteus mirabilis*. Previous reports had implicated most of the bacteria isolates listed above as common pathogens isolated from hospital environment (Amadi and Amadife, 2006; Madigan *et al*., 2000; Ogunbi and Anyiwo, 1998; Atlas, 1988; Fuest, 1983).

The antibiotic sensitivity pattern of bacterial isolates from the different sections of the hospital varies even within the same species (Table 2). This is more prominent in the case of *Staphylococcus aureus* isolated from different sections of the hospital. *Staphylococcus aureus* isolated from OPT and MSW displayed more resistance to the antibiotics when compared to the other strains isolated from MMW and FMW, respectively.

The antibiotic observed to be most effective was clindamycin (90.90%). The high incidence of multidrug resistance may presumably be due to indiscriminate use of antibiotics (Okeke *et al*., 1999). The release of these multidrug resistant microorganisms may eventually lead to the saturation of the environment with antibiotic resistant microorganims (Jawetz *et al*., 1984). The drug resistant bacteria can spread in the environment where man and animal acquire infection with bacteria carrying resistant plasmid (Joseph *et al*., 1979).

The study reveals that State Specialist Hospital Akure harbours bacteria that have resistance against a lot of the commonly used antibiotics such as septrin (36.36%), augumentin (9.09%), ampicillin (18.18%). The hospital management is advised to do periodic monitoring of the hospital environment. Periodic disinfection of these sections should also be carried out to reduce the TVC.

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